

IMPERIAL
DEPARTMENT OF AGRICULTURE
FOR THE WEST INDIES



REPORT
ON THE
AGRICULTURAL DEPARTMENT
DOMINICA
1923-24

BARBADOS
ISSUED BY THE IMPERIAL COMMISSIONER OF AGRICULTURE
FOR THE WEST INDIES

1924

[Price Sixpence.]



REPORTS

ON THE

BOTANIC STATION, ECONOMIC PLOTS AND AGRICULTURAL EDUCATION DOMINICA

Annual Reports on Certain Economic Experiments conducted in connection with the Botanic Station, 1900-2.

Annual Reports on the Botanic Station for the years 1901 and 1902.

Annual Reports on the Botanic Station, Economic Experiments and Agricultural Education, for the years 1902-3 to 1921-22.

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LETTER OF TRANSMITTAL

Commissioner of Agriculture to His Honour the Administrator, Dominica.

COPY

No. D. 2016

Trinidad, 24th October, 1924

Sir,

I have the honour to forward the Report on the work of the Agricultural Department, Dominica, for the year ended 31st March 1924.

2. The report constitutes a valuable review of the work of the Department and also a discussion of many points which are of interest to the agricultural community of Dominica.

3. As it is the first report that I have reviewed since I took up the post of Imperial Commissioner of Agriculture I should like to express my appreciation of the energy displayed by Mr. Jones which the report clearly exhibits.

I have &c. ,

(Sgd.) H. MARTIN LEAKE,

Commissioner of Agriculture
for the West Indies.

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STAFF OF THE AGRICULTURAL DEPARTMENT, DOMINICA.

JOSEPH JONES	Agricultural Superintendent and Curator of the Botanic Gardens and Experiment Stations.
ALFRED KEYS	Asst. Curator (resigned July, 1923)
F. J. BAPTISTE	Foreman.
W. G. HUTTON	Clerk.
A. JOSEPH	Overseer

REPORT ON THE AGRICULTURAL DEPARTMENT, DOMINICA,

For the Year ended March 31, 1924.

Work in the Gardens and Observations on Plants.

For the sixth year in succession the rainfall at the Gardens has been below the average, and during the period under review, so much so, as to affect severely the health of many plants which require a considerable rainfall and a high percentage of humidity for their well being. Watering operations, on a scale never before required, had to be carried on in order to keep alive many valuable specimens.

In any large collection of tropical plants, such as exists in the Dominica Gardens, there are many species which succeed very well during dry periods while others, amongst which are the *Amherstia nobilis* and various shade loving trees, suffer under such conditions. In the former class will be found the Cassias, Tecomas, Butea and similar hardy specimens. Fortunately the floral display made by these trees in the dry season affords some compensation for the parched and brown coloured lawns, and the generally distressed looking conditions which are concomitant with a long period of drought.

There is little to report in the way of improvements in the Gardens or to buildings, etc. A considerable amount is required under these heads, but nothing can be done by the Government under the present depressed financial conditions unfortunately brought about by the partial failure of the lime crop owing to wither-tip disease. Such matters as the provision of garden seats purchase of iron labels for plants, renewal of picket fencing which divides the ornamental from the economic grounds, and the painting and repairing of buildings, have to be held over for the time being.

Very few ornamental plants were introduced during the period under review, and one only of outstanding interest, namely, *Warszewiczia coccinea*. Of the nine plants of this species presented by the United States Department of Agriculture, seven are now doing well in spite of the dry weather. It is to be hoped that this fine flowering tree will be successfully established.

The following exotic plants flowered in the Gardens for the first time: *Cassia Sieberiana*, *Lysidice rhodostegia*, and *Myricaria cauliflora*.

Work in the Nurseries and Distribution of Plants.

Owing to the outbreak of withership disease of limes, the raising of seedlings of the common lime for sale— which has always been such a large feature of the nursery work— was brought to a close. Efforts will now be made to propagate and test under Dominica conditions a number of varieties of sour citrus recently imported and which are said to be able to resist withership disease.

When it is remembered that every estate in the island is provided with a factory for dealing with the lime and its products, it will be seen how very necessary it is that every effort possible should be made to keep the industry going. There are hopeful signs that the common lime, if well cultivated and soundly manured, may, in favoured situations on the Leeward Coast, be able to continue to yield profitable crops, but it is clear to all that if a citric acid industry is to be maintained in the wet districts replacement of the common lime by an immune variety is an essential proceeding. Even on the dry coast line, any future plantings should be made with immune varieties and not with the seedling lime.

During 1923 the Agricultural Department imported budwood of a number of varieties of sour citrus and these were successfully budded on sour orange stocks. It is now intended, as soon as weather conditions permit, to form small plots of the various kinds on the old nursery grounds at Morne Bruce, primarily as a source of supply of budwood of any variety found worthy of cultivation, and, as propagation proceeds to start small plots in the wet districts in order to note the growth, habit, resistance to disease, fruiting qualities, yield of juice and citric acid content under the climatic conditions of each locality. Should, as a result of these tests, any variety or varieties prove suitable for cultivation their propagation on a large scale could then be undertaken.

It is not yet generally understood by planters that in the event of a type being found fit for cultivation propagation can only be effected by budding it on the sour orange or other suitable stock. The probable output of this class of plants from the Government nurseries, even if worked on a large scale, would hardly be sufficient to meet the demand likely to arise, therefore it would be necessary for estates requiring large supplies to start the growing of sour orange seedlings and to arrange for budding to be done on the spot, in order to help matters forward. Further, in the event of very large numbers being required, it is to be hoped that nurseries under private ownership would come into existence and take part in the work.

To the present, Dominica, and to a lesser extent, other parts of the West Indies have been fortunate in being able to carry on an important industry by means of a seedling tree which could be easily and cheaply raised.

It has now to be clearly understood as far as Dominica is concerned, that the day of the seedling lime plant as a source of citric acid, is over, and that in future the budded plant is alone available for this work. Provided a suitable variety immune to withership can be found, this means that the cost of planting per acre will be greatly in excess of the sum required for seedling plants, that greater care will be needed in handling, planting, and growing them, and, if, success is to be achieved, a standard of manurial and cultural treatment much higher than that usually applied to seedling limes on estates will be necessary. But given this attention, coupled with careful selection of land, and grit and determination on the part of planters, an industry should ultimately be built up in which the capital invested would be much safer, owing to the use of budded stock, and the returns per acre equal to those obtained during the best years of the seedling lime industry.

Plant distribution is again unsatisfactory, which is due to a falling off in the demand. The output is the lowest on record over a period of thirty-three years.

IMPORTATION AND DISTRIBUTION OF PLANTS

The number of plants sent out during the year was as follows:—

Limes	...	...	4,865
Budded Washington Navel Orange	...	...	211
" Grapefruits	...	...	8
" Lemons	...	...	50
" Portugal Orange	...	...	15
" Tangerine	...	...	20
" Sweet Limes	...	...	8
Grafted Mangoes	...	...	78
Cacao	...	...	175
Coffee	...	...	250
Cashew	...	...	560
Vanilla	...	...	2,285
Nutmegs	...	...	80
Camphor	...	...	6
Mangosteens	...	...	14
Cloves	...	...	22
Miscellaneous	...	...	290
			Total 8,437

The following supply of miscellaneous seeds, seedlings and cuttings were also distributed:—

Vegetable seeds	...	1,320 packets
Onion seedlings	...	40,000
Sugar Cane cuttings	...	8,700
Uba " "	...	7,250
Shade tree cuttings	...	1,325
Elephant Grass cuttings	...	4,400
Lemon grass plants	...	1,100
Black Pepper cuttings	...	200

PLANT IMPORTATIONS.

In the Progress Report for 1922-23 reference was made to the importation of seeds and plants of the Chaulmogora tree *Taraktogenos Kurzii* and allied species, *Hydnocarpus anthelminthica* and *H. castanea*.

At the present there are five plants of the first named species growing in the Gardens, all of which are doing well, although the weather conditions have been far from favourable. The largest specimen has now attained a height of ten feet. The two plants of *Hydnocarpus anthelminthica* are also growing fast, having reached a height of eight feet in a year and a half. Little growth has been made by the two specimens of *H. castanea* and it is already evident that this species will be more difficult to grow under our conditions than *T. Kurzii* and *H. anthelminthica*.

Early in April ten plants of *Oncoba echinata*, which yields the "Gorli" seeds of Sierra Leone, a source of chaulmoogra oil, were received from the United States Department of Agriculture, and another consignment of the same number of plants followed in June. Seventeen of these were placed out and are growing nicely.

During the year several thousand seeds of *Taraktogenos Kurzii* were received from the Commissioner of Agriculture. Although carefully packed the journey from India proved too long for the viability of the seeds; consequently no germination results were obtained.

Efforts to obtain specimens of *Hydnocarpus wightiana*, *Asteriastigma macrocarpa* and others of this class failed, but it is to be hoped that these additional species will be added to the garden collection at no distant date.

Seeds of *Anona diversifolia* were received from Cuba, and a batch of plants raised for trial.

A few tubers of the Arracacha, *Arracacia esculenta*, a vegetable largely grown in the mountainous districts of Colombia, were presented by Mr. O. W. Barrett, Agricultural Adviser to the Government of Porto Rico. This plant is being propagated for distribution to growers in the hill districts as it is likely to do well under fairly cool conditions. Should the new introduction be found to succeed, it will add further variety to our already large collection of vegetable foods.

A considerable number of plants of the Pejibaye, *Guilielma utilis*, were received from the United States Department of Agriculture. This palm already exists in the Botanic Gardens, but it does not do very well and fails to produce fruit. Another specimen is known to be growing and fruiting at Laudat, in which place the conditions are much damper than at the Gardens.

Plants have been distributed to persons possessing land in the wet districts, as it is likely to do well under moist conditions. The fruit, when boiled in water, to which salt has been added, forms a palatable dish. Its successful growth on some scale would add further to our list of locally raised foods.

Notes on Economic Plants.

Camphor :—There are now 160 plants of the true camphor growing in the Experiment Station, 60 of which form plot cultivation, and the remainder are planted in a row in order to act as a wind belt.

Although the rainfall has been below the average during recent years, the plants have done well on the whole.

It is interesting to record that a few specimens in a plot made up of eighteen trees planted in 1915 have commenced to fruit. Seeds were ripened during 1923 and seedlings raised. If these trees now commence to fruit regularly it may be possible to raise plants in considerable quantities for distribution. This would permit of trials being made on estates in order to test the growth and yield of the trees under varying climatic conditions. The return given by camphor trees at the Experiment Station is an average one, but it remains to be seen if this tree will grow well and yield normally in districts having an annual rainfall of well over 100 inches.

The great requirement of the interior districts is the need of an economic tree capable of thriving under wet conditions and of yielding a valuable product, small in bulk, so as to allow of easy and cheap transport over bridle tracks to the coast. It remains to be found by experiment whether the camphor tree is likely to meet these requirements.

Specimens of camphor have been prepared at the Federal Laboratory on several occasions from leaves and twigs grown in Dominica. During the period under review a small exhibit of Camphor was sent to the British Empire Exhibition.

Shea Butter tree :—A single plant of this interesting species was received from Kew in the year 1899. It is now a fine specimen and has borne fruit annually since 1913.

During 1918 Shea nuts were sent to the Director, Kew Gardens, with a request that they be forwarded to the Imperial Institute for comparison with those shipped from West Africa, and for examination of the fat content. In the report which followed it was stated that the nuts and kernels from Dominica are not smaller or lighter than the bulk of the nuts and kernels from West Africa, but it was found

that the Dominica kernels yielded a slightly lower percentage of fat. The latter is probably due to changed climatic conditions; the rainfall at the Botanic Gardens Dominica being nearly twice the amount of that recorded in the habitat of the Shea Butter tree

Of the nine seedlings growing in the Experiment Station now ten years old seven have reached the flowering stage. This tree makes very slow progress during the first three or four years. After this stage growth is somewhat accelerated, but it is never rapid.

There is some probability that this tree would succeed on the dry coast lands of the Leeward Coast. Owing to its slow growth during the early stages, its successful establishment under those conditions would require the attention of some one who loves plants, and is not over concerned about values and possible returns. It is a matter for regret that so little interest is taken in this island in exotic plants. Many such have been distributed from the Gardens but very few have been cared for and established. The fact that many of them were of considerable potential value passed unnoticed. Therefore it comes about that Dominica, which is so eminently suited for the growth of a wide range of economic plants owing to the varying rainfall and humidity, and to the existence of zones of climate, remains, owing to want of interest, miserably poor in a matter in which it should be very rich.

Oil Palms :— During recent years importations of seed of the best varieties of Oil Palms, *Elaeis guineensis*, have been made and plants raised and distributed to the various districts. Should these palms be successfully established, it is evident that supplies of seeds produced locally from the best varieties would be a very valuable asset in case of the cultivation of this plant being undertaken at some future time in this island.

Although very large supplies of the Oil Palm exist in West Africa, its cultivation is already being taken up in the Eastern Tropics, notably in Sumatra, in which island a very large acreage has already been planted.

The Oil Palm does not succeed very well in the Botanic Gardens or close to the sea on the Leeward Coast, but it grows with great vigour at some distance up the valleys where the rainfall is heavier.

It is hoped that those who possess these plants will value them in view of possible developments, and also bear in mind the very great advantage which the possession of seeds of good types gives to intending growers.

Touka Bean, (*Dipteryx odorata*) :— This is another likely subject for experimental work in Dominica. A specimen has been fruiting in the Botanic Gardens for years, and successive batches of plants were raised, for which, unfortunately, no demand arose. It is now probable that small plots of this tree will be formed in some of the wetter districts in which limes can no longer be grown.

(Vide page 34 for further remarks on this Industry.)

THE LIME INDUSTRY.

Owing to low prices and the difficulty of effecting sales quickly in London the majority of planters agreed on a common line of action in regard to concentrated lime juice. For the time being it is intended to hold stocks in the island until sales at satisfactory rates, if possible, can be brought about. A considerable amount of good has already followed this collective action, better prices for this product have been obtained, as well as a reduction in warehouse and other expenses.

It is largely due to this arrangement for holding stocks, rather than to the ravages of wither-tip, that the figures for the year under review make such a poor showing. These figures, which refer to the calendar year and not to the official year require some explanation. In this connexion it should be noted that the carryover from 1922 to 1923 was considerable, and that the crop held in the island at the end of 1923 was very large. During the first six months of 1924, the export of lime products, the bulk of which must have been produced during 1923, represented no less than 242,000 barrels of limes. It would therefore appear that the crop for the whole island during 1923,

THE LIME INDUSTRY.

was, despite withertip disease, a fairly satisfactory one, though the shipments during that period were low. Calculated, as usual in barrels of a capacity of 4.55 cubic feet, the produce exported represented 227, 945 barrels of fruit.

The lime crop for the past five years calculated in barrels of fruit and expressed in round numbers is recorded below :—

1919	...	402,000
1920	...	369,000
1921	...	516,000
1922	...	400,000
1923	—	228,000

The following table calculated on the usual basis* shows the disposal of the crop under the various heads :—

Product.	Barrels of fruit.	Approximate percentage of total crop.
Concentrated juice	118,908	52.1
Raw juice	57,186	25
Fresh limes	20,748	9.1
Citrate of lime	21,568	9.4
Citric acid crystals	9,256	4

Comparison with the figures of last year's disposal of crop shows the following changes. The proportion shipped as concentrated juice fell from 60.9 to 52.1 per cent, and that shipped as raw juice rose from 9.6 to 25 per cent. Fresh limes represented 9.1 per cent of the crop shipped. Citrate of lime showed a heavy drop from 21.5 to 9.4 per cent while citric acid crystals improved from 1.7 to 4 per cent. The small business carried on in pickled limes and in lime juice cordial accounted for 279 barrels of limes only.

The weather conditions were again favourable throughout the year; there having been an absence of high winds and torrential rains. The dry weather experienced undoubtedly operated in favour of the orchard cultivation carried on; the possible exception to this statement being a narrow coastal strip in the south west district of the island.

The export of products of the lime industry during 1923 is recorded below:—

Product.	Quantity.	Value. £.
Concentrated lime juice	79,272 gallons	21,800
Raw lime juice	42,875 „	27,188
Lime juice cordial	2,477 „	584
Fresh Lime	20,748 barrels	22,688
Pickled limes	180 „	189
Citrate of lime	181,629 lb.	5,677
Citric acid crystals	51,833 „	4,535
Essential oil of limes	43,482 „	7,141
Otto of limes	13,762 „	3,785
		£93,587

*50 gallons of concentrated juice represents 75 barrels of lime fruits : 7½ gallons of raw juice represents 1 barrel of lime fruits : 1 ton of citrate of lime is equivalent to 226 barrels of lime fruits: 1 ton of citric acid is equivalent to 400 barrels of lime fruits.

Minor Industries

Coconuts :—Efforts to bring about greater interest in this product cannot be said to have met with much success. With the exception of the Lasoye Districts, in which place coconuts are being grown on some scale, there is a general disinclination to undertake this cultivation. It is difficult to understand this attitude on the part of planters and peasants as there are large areas of land in the island which are admirably adapted for this product. There is no other permanent crop so well suited to local conditions. The reasons advanced against the growing of coconuts, and other crops such as high class fruit trees, are far from convincing, and it is regrettable that such views should be so generally held.

Tobacco :—Experiments in the growing of tobacco were commenced in October, 1923, under the direction of a Committee of the Agricultural Society. The curing of the leaves is now in progress. The assistance of Mr Brookes, a tobacco expert, in the employ of the Government of St Kitt's was obtained in the early part of the experiments. It is expected that Mr Brookes will pay another visit to Dominica in this connexion.

Should the production of black leaf tobacco prove successful, this cultivation could be taken up by the peasantry. It is probable that the tobacco leaves, as soon as ready to cut in the field, would be readily purchased locally at fair rates. Persons who had small plots of tobacco this year were able to dispose of the green leaves at prices ranging from 2d to 3d per lb.

Ginger :—The attention of planters has been drawn to the possibilities of ginger cultivation. There is however, a shortage of rhizomes for planting, and none can be obtained from Jamaica or other West Indian islands. Certain interested growers are collecting all the material possible in order to produce sufficient to plant considerable areas in the future. Progress in this direction is necessarily slow for the first year or two. It is hoped these initial efforts will be followed up as there can be no doubt that the soil and climate of certain districts are highly favourable for the production of high class ginger.

Bananas :—The situation in regard to bananas remains obscure. There is a large forest area in the vicinity of Portsmouth which is suitable for growing this fruit, while each of the large valleys on the Leeward Coast is capable of adding its quota for export. Internal transport, as everyone knows is bad, but something may be done to overcome this in case of a single large area being brought under cultivation such as could be done on lands near to Portsmouth. It is affirmed that the planting of bananas is proceeding on some scale at St. Lucia, but it is difficult to say how one small West Indian island is going to produce a sufficient number of buncos to fill a fruit steamer at intervals of two or three weeks. The probable need for a larger producing area than can be obtained in any one small island has been sooner or later, operate in Dominica's favour.

During the year under review, an experiment plot of a banana known as the "Porto Rico" has been started. This variety, which is probably identical with the Congo banana of Surinam, was introduced into Dominica from Martinique about thirteen years ago, and it is now the popular banana in the Grandbay District. Its cultivation is being gradually taken up in other parts of the island, and it bids fair to oust the "La Rose" from the premier position which the latter has held over a long period.

For local purposes the "Porto Rico" banana appears to be superior to the "La Rose." It does not grow so tall as the latter, fruits in less time, and bears a larger bunch. Although it takes a considerable time, from the cutting of the bunch to the ripe stage it is not acceptable as a shipping banana, owing to the irregular ripening of the fruit. It possesses a number of good qualities over the "La Rose" variety as a local food plant, and, up to the present, appears to be unaffected by Panama disease.

A few suckers of a banana known as the "Giant Figure" in Grenada, were introduced and are being grown experimentally.

Coffee :—Considerable sowings of seeds of *Coffea robusta* have been made in order to raise plants for trial. This species does very well in the Botanic Gardens, and it may be found to be suitable for planting in districts in which lime cultivation can no longer be carried on.

Nutmegs :—Large numbers of plants are being raised in the hope that both planters and peasants will undertake to cultivate this valuable tree in sheltered areas in the damper districts of the island. The nutmeg does very well under such conditions. Another spice tree to which greater attention should be given is the Clove. It also grows well under the same conditions as those which suit the nutmeg tree.

Vanilla :— A good deal of attention has recently been given to the planting of vanilla, which, if followed up with good treatment should result in an increase in production in two or three years. A point of great interest is that several parties in the island are now able to cure the beans in a satisfactory manner. This has led to some competition in buying. During this season green vanilla beans brought to town by peasants have been readily sold at satisfactory rates. Efforts will be made to interest peasants in this product to a further extent. In some measure green vanilla-pods should, as a source of income, take the place of limes formerly produced on small holdings.

Peasants are also being urged to take up the cultivation of castor seeds, to attempt the production of commercial papain, and to undertake onion cultivation.

Fruit Growing :— This matter of fruit production has been referred to in previous reports, to which references may be made for detailed information. There can be no doubt that certain areas are well suited for the growth of grafted mangoes, avocado pears, and also for the celebrated mangosteen. All the kinds mentioned would find a ready sale at remunerative rates in Barbados, Bermuda, and possibly New York, if placed on the market in good condition, which they could be, if the necessary care were given in picking, handling and packing the fruits.

Unfortunately very little appears to have been done in this matter of planting grafted mangoes. Each year, as the season comes round, there is a keen demand for the few thousands of "Julie" mangoes produced by the trees under the control of the Agricultural Department. There are no lack of traders in this line, if sufficient fruit could be got, but there is a lack of those necessary individuals, the cultivators. The comparatively few high class mango trees now present in the island are grown for private use, and there is no instance to date of even half an acre of land having been planted with these trees with the intention of raising fruit for export.

The same conditions apply in regard to the avocado pear, of which many excellent varieties exist, that is, a perfectly favourable environment for production, but, owing to want of effort, an altogether inadequate output for export purposes.

The mangosteen, although introduced nearly forty years ago, may still be termed a very rare tree. Only a few fruiting specimens are to be found in the island. The distribution of plants has been going on for years, and it is felt that had these been cared for, the export of this fruit on a small scale to places like Barbados and Bermuda might now be going on.

At the present there are over 200 seedling mangosteen plants in the nurseries, which are unsaleable at any price, and even undisposible free of charge for planting locally.

NOTES ON SUBSIDIARY INDUSTRIES.

It is difficult to understand this lack of interest in a valuable fruit tree like the mangosteen. Plants are available, and the experimental stage of cultivation has passed. The tree thrives and fruits well in the Botanic Gardens, 50 feet above sea level, with an annual rainfall of 80 inches. It grows with great vigour at Pointe Mulatre at an elevation of about 300 feet, and with a rainfall of about 120 inches per year. The latter situation probably represents ideal conditions for the mangosteen in Dominica. As these conditions are to be found in every large valley in the island, there is undoubtedly a wide scope as regards area and climatic suitability for the successful cultivation of the mangosteen, which, it should be remembered, is a highly prized fruit tree of the Eastern Tropics.

The above notes refer to work done and observations made during the year under review, but fuller information on this subject of minor cultivations has been supplied to planters and peasants by the publication of a paper on "Minor Industries in the Leeward Islands" by the Hon. A. E. Collens, F.I.C., F.C.S., Government Chemist & Superintendent of Agriculture, and F.H.S. Warneford, M.A., B.Sc., Assistant Chemist. This paper which was read at the Agricultural Conference held in Jamaica in January 1924, was reprinted by the Dominica Government and widely distributed in the island. It contains much information of great value to planters at this juncture.

AGRICULTURAL EXPORTS.

CHIEF EXPORTS.

TABLE OF AGRICULTURAL EXPORTS FOR THE TRIENNIAL PERIOD
1921 TO 1923.

	1921.	1922.	1923.
<i>me Products:</i>			
Concentrated juice ...	227,716 galls.	162,222 galls.	79,272 galls.
Raw juice ...	112,317 "	286,782 "	428,895 "
Lime juice cordial ...	...	4,226 "	2,477 "
Distilled lime oil ...	51,524 lb.	76,150 lb.	43,482 lb.
Essenced oil of limes ...	18,551 "	24,267 "	13,762 "
Citrate of lime ...	10,328 cwt.	722,400 "	181,629 "
Green limes ...	21,883 brls.	24,389 brls.	20,748 brls.
Pickled limes ...	399 "	444 "	180 "
Citric acid ...	2 cwt.	38,864 lb.	51,833 lb.
<i>Cacao Products:</i>			
Cacao ...	6,764 cwt.	640,304 lb.	631,908 lb.
Prepared cacao ...	1,223 lb.	341 "	454 "
<i>Coconut Products:</i>			
Coconuts ...	299,787	214,289	206,138
Copra ...	...	1,990 lb.	42,561 lb.
<i>Coffee Products:</i>			
Coffee ...	10 cwt.	4,531 lb.	350 lb.
<i>Sugar Products:</i>			
Rum ...	...	265 galls.	...
Syrup ...	400 galls.	£43 worth	...
<i>Spices:</i>			
Vanilla ...	486 lb.	1,569 lb.	668 lb.
Nutmegs ...	£96 worth	...	...
Ginger ...	29 brls.	2,600 lb.	3,760 lb.
<i>Honey Products:</i>			
Honey ...	3,412 lb.	227 lb.	4,225 lb.
Bees Wax ...	...	...	166 "
<i>Various Products:</i>			
Bananas ...	2,914 bunches	3,381 bunches	1,592 bunches
Oranges ...	1,294 brls.	1,564 brls.	1,013 brls.
Mangoes ...	£1,036 worth	7,880 crates	3,782 crates
Grape fruits ...	...	326 "	381 "
Pears ...	...	1,091 "	1,076 "
Miscellaneous fruits ...	£238 worth	...	£50 worth
Bay oil ...	3,000 lb.	3,143 lb.	9,132 lb.
Orange oil ...	844 "	1,867 "	1,522 "
Kola nuts ...	£25 worth	£10 worth	£10 worth
Cassia fistula ...	£86 worth	£50 "	2,664 lb.
Tamarinds ...	...	56 brls.	16 brls.
Vegetables ...	£53 worth	...	...
Farine ...	...	...	784 lb.
Hides and skins ...	33 lb.	42 lb.	528 "
Leather unmanufactured ...	...	...	666 "
Plants, bulbs and seeds ...	...	...	£10 worth
Fruits, jam and jellies ...	523 lb.	539 lb.	389 lb.
Hats ...	...	£15 worth	...
Turtle shell ...	...	...	338 lb.
Baskets ...	...	...	£18 worth
<i>Forest Products:</i>			
Hardwood ...	224,245 feet	71,219 feet	36,990 ft.
Firewood ...	£16 worth	239 tons	560 cords
Canoe shells ...	62	34	10
Hoops ...	£204 worth	...	...
Shingles ...	86,230	58,350	10,400
Charcoal ...	£47 worth	5,307 lb.	5,474 lb.
Ships and boats ...	...	...	£40 worth
Total values ...	£201,418	£150,243	£113,971

Work Connected With Insect and Fungus Pests and Their Control.

The unfortunate outbreak of withertip disease of limes in May 1922 and its rapid spread on lime plantations throughout the island was fully discussed in the Progress Report for 1922-23. In the same publication will be found recommendations made by the Mycologist of the Imperial Department of Agriculture after his inspection of certain affected areas in the island, and also a summary of the report presented to the Government of Dominica by the Assistant Curator on his visit to Florida in this connexion.

During the year 1923 and early in 1924 the situation may be described in a few words; in the very wet districts an intensification of the disease, and on the dry Leeward Coast a hope, which is increasing, that lime growing under favourable environmental conditions, if backed with suitable manurial and cultural measures, may continue to be carried on with profit to the planter and with benefit to the island.

After some correspondence between the authorities, it was decided to ask Mr. F. Stell, Mycologist on the staff of the Department of Agriculture, Trinidad, to visit Dominica. Mr. Stell accepted and arrived in the island on October 26. After an inspection of the principal cultivations he left for Trinidad on December 5. Before leaving it was arranged that Mr. Stell should pay another visit to Dominica during one of the flowering periods of the lime tree.

At about this time (December 1923) it became known that an official from the Bureau of Mycology, London, would attend the Agricultural Conference to be held in Jamaica in January 1924. As this appeared to be a good opportunity for a member of the Bureau to obtain first hand knowledge of conditions in Dominica the Agricultural Department suggested to the Government that an appeal should be made to the Colonial Office to sanction such a visit. This advice was at once acted upon and it resulted in Mr. Wiltshire arriving in this island on February 15, 1924. Arrangements had also been made for Mr. Stell's second visit to coincide with the arrival of Mr. Wiltshire in order that both scientists could consult together. After inspecting some of the principal estates, Mr. Wiltshire left for England on February 25 and Mr. Stell who stayed behind in order to make a complete tour of the island, sailed for Trinidad on March 15.

As a result of these visits three reports were issued, two by Mr. Stell, and one by Mr. Wiltshire. These were published as quickly as possible after receipt and widely distributed to planters and others interested in lime cultivation. Full information being in the hands of growers it is unnecessary to do more here than to summarize briefly the recommendations put forward.

Mr. Stell's conclusions are as follows:—

That there is great variation in climate factors such as humidity, sunshine, rainfall and wind in different parts of the island; and these factors often show marked variations in localized areas.

Spraying as a direct method of control admits of very limited application, but cultural modifications could with advantage be brought into operation in certain specified areas.

An intensive system of agriculture including contour drains and mulching would prove remunerative on existing lime areas on sunny slopes near the coast.

There appears to be no future for lime cultivation in areas of normal high rainfall.

Approves of the steps taken by Agricultural Department to grow and test varieties of sour citrus thought to be immune to withertip with a view to the replacement of the common lime by a suitable immune variety in areas of moderate rainfall.

Recommends a diversified agricultural policy, as dependence on a single crop is unbalanced, unsound and unwise.

Mr. Wiltshire in his report while appreciating the very great difficulties of the situation, advocates the spraying of lime trees in suitable areas with a view to finding the cost of carrying on this work; recommends the breeding of immune varieties of sour citrus; the improvement of cultural methods in coastal districts so as to accord with those carried on at the Experiment Station, as well as the growing of other crops by planters.

THE EFFECT OF ENVIRONMENT ON LIME CULTIVATION

Considerable stress has been laid on this matter of environment by Mr. Stell, and his recommendations should be carefully studied by planters possessing cultivations in those localities to which his remarks apply. A good deal depends on the steps taken in this matter. If withertip becomes sufficiently intense on estates in the coastal districts to make lime cultivation unprofitable, the general situation in the island, already serious, will become worse. If, however, by taking action on the lines suggested by Mr. Stell, lime production can be maintained at from 200,000 to 250,000 barrels of fruit annually, the profits on this output should help to carry the island over a difficult period and permit of steps being taken to establish other crops.

The full effect of withertip on lime trees in coastal areas under the varying climatic conditions has still to be learned, and this information will only come with the passage of time, and then only to those who are alert and make careful observations on the situation. No doubt some information will be garnered in the Experiment Station, but this piece of lime cultivation receives some of the moisture laden air currents from the Roseau Valley, therefore it is not nearly so well situated to resist withertip as other areas under limes on estates in the vicinity and other parts of the Leeward Coast. It is, as Mr. Stell points out, the trees growing on sunny slopes protected from damp valley breezes, which hold the best prospects for the future. Such areas, as every one knows, are now more or less neglected, and it remains for planters by applying good cultural and manurial measures, to effect a change for the better. There are hopes that well conditioned trees growing in open situations and protected from damp valley breezes by the natural conformation of the land may prove profitable cultivations even in the presence of withertip. It is now necessary for planters to study the situation on estates very closely, in order to find which sections of fields are giving the best returns. In places in which yields are good every effort should be made to keep the trees in good order; where otherwise the lime cultivation should be replaced by other crops.

The attention of the officers of the Agricultural Department was recently drawn to a case in which lime trees growing under shade in a coastal district had set much more fruit than the surrounding cultivation which was without shade. A possible explanation is that the shade trees kept the heavy dews off the lime trees and thus enabled a better setting of fruit to be brought about. Something on the same lines has been observed in the Experiment Station, where in certain places a heavy bearing of fruit is being carried on the inner branches, and not as in pre withertip days mainly on the outside branches of the tree. Again the question arises as to whether the flowers borne on the old inner branches were sheltered from the dew by the leafage of the tree to a sufficient extent to allow of a good setting being obtained. Further observations along these lines are needed, and tests might be made on a small scale to find if trees protected from the heavy dews during the following periods will set fruit freely. The point is an interesting one, but, even if found successful, the general application of such a form of protection to lime fields would appear to be as impracticable as the suggested carrying on of annual spraying campaigns.

Another matter, which is a climatic one, also needs consideration. For six years in succession, precipitation has been below the average. At the Botanic Gardens the mean rainfall for this six years period is 65.72 inches against an average annual rainfall of 75.89 inches over a period of thirty-one years. Should a series of wet years now commence, which is very probable, the mean rainfall at the Gardens could rise to as much as 85 inches per year. The effect of a higher rainfall on the Leeward Coast, if the distribution is such as to increase humidity, may prove very unfavourable to those lime cultivations, which, to the present, have not been very seriously affected by withertip disease.

IMPORTATION OF DUSTING APPARATUS.

In order to carry out experiments in dusting trees for the control of withertip, a number of machines, both power and hand, were imported, as well as supplies of dusting material. In these matters the recommendations made by Professor Ashby of the Imperial Department of Agriculture were followed.

Owing to the late arrival of the machines and materials, which in the first place were shipped to San Domingo, but little time remained for experimental work, as the flowering season was coming to a close. Operations were carried on at the Bath Estate with a power machine, and at the Experiment Station with hand machines, under the direction of the Assistant Curator. The work yielded no definite results. In order to show the difficulties encountered to level areas in Dominica, it may be stated that the same type of small power machine used on this occasion is easily handled by two men in Florida. At the Bath Estate owing to the presence of boulders and the existence of necessary drains, it took six men to move the machine about. It is therefore, not quite safe to assume that these operations are just the same on all level areas in all countries.

At that time (July 1923) the Assistant Curator resigned, and at the end of the official year, (March 1924) the post was still vacant. When assistance is forthcoming it is intended to carry on a further series of dusting experiments.

IMPORTATION OF VARIETIES OF SOUR CITRUS.

Budwood of the following varieties of sour citrus were supplied by the United States Department of Agriculture and successfully budded on sour orange stocks:—
 Tahiti or Persian Lime.
 Kusai Lime.
 Bears' Seedless Lime
 Wogham's Round Seedless Lemon.
 Eustis Limequat.
 Sour Lime.
 Calamondin Lime (*Citrus mitis*).

In addition a few seeds of the Kusai lime were obtained from the Agricultural Department Hawaii, by the Commissioner of Agriculture, and sent to Dominica. A few plants were raised. Experiments are being made with the Rangpur Lime, and also with a variety of Lemon, which, so far, has proved immune to withertip.

As soon as the weather permits it is intended to plant out experiment plots at Morne Bruce for the supply of budwood, and to distribute plants for trial on estates in the wet districts. In the event of any variety or varieties proving resistant to withertip, propagation by budding on a large scale will be undertaken. The necessary steps to this end, that is, the raising of many thousands of stocks of the Sour Orange and Rough Lemon, have already been taken.

In addition to the varieties mentioned above, a number of plants representing thirteen other kinds of sour citrus were received from the United States Department of Agriculture, and these are also being grown experimentally.

Efforts are being made to obtain seeds and budwood of other varieties which it is desired to experiment with in this island.

BRITISH EMPIRE EXHIBITION.

The work of preparing exhibits was carried out by the Permanent Exhibition Committee under the Chairmanship of A. R. C. Lockhart, Esq., with the Curator of the Botanic Gardens as acting Honorary Secretary.

PLANT LEGISLATION.

Owing to an early appreciation of the work and expenses involved, the Committee were able, by carefully nursing their resources for several years past, to meet all local expenses in connexion with the Dominica exhibit, as well as expenses at the Exhibition, from the Annual Votes provided on the Estimates; therefore no special money vote was needed in this instance.

In response to appeals for exhibits published in the local press, a large number of samples were received, and these, packed in twenty-three cases were shipped away during February and March.

Mr. L. Rose, of the well known firm of L. Rose & Co. Ltd., kindly undertook to act as representative of Dominica at the Exhibition, an honorary position which means the acceptance by him of a large amount of work on behalf of the island.

On the despatch of the last of the exhibits, His Honour the Administrator cordially thanked the officers and members of the Committee for the work done in this connexion. It is hoped that the collective exhibit will prove creditable to Dominica.

Plant Legislation in Dominica.

The first step in the direction of plant protection was taken in 1898, when Act No. 3 was passed to provide against the importation of articles likely to introduce diseases among plants. Under the authority of this Act, a Proclamation dated August 27, 1898, prohibited the importation from Ceylon of plants, seeds, berries, earth and soil. This Act was suspended by Law No. 9 of 1904, in which provision is made for the fumigation and disinfection of imported plants, cuttings, buds, grafts, bulbs, roots, and seeds, and their packages: also fruit and vegetables intended for propagation, and not for consumption as food.

Under Law No. 6 of 1907 power is conferred to prohibit by proclamation the importation of plants, cuttings, bulbs, roots, seeds, or berries, or any earth or soil, or any articles packed therein, or any packages, or other articles or things likely to be the means of introducing any plant disease.

A Proclamation dated February 5, 1909, under No. 6 of 1907, prohibits the importation into Dominica of all plants from Dutch Guiana, which are likely to be a means of introducing disease from that country.

A Proclamation dated October 26, 1910, prohibits the importation of banana plants and suckers from all countries of Central or South America, and from the island of Trinidad, also of coco-nuts in husk, and all growing plants or parts of plants of coco-nuts, from Cuba, Jamaica, Trinidad, and all countries of Central or South America.

A Proclamation dated October 9, 1916, restricts under certain conditions, the entry of rooted plants of all kinds from the United States of America, Cuba, Jamaica, Haiti, San Domingo, and Porto Rico.

A Proclamation dated October 26, 1917, prohibits the importation of seed-cotton or cotton seed from all countries or places outside the Colony of the Leeward Islands, save and except from some other Presidency of the Colony, or from the Colony of Trinidad and Tobago, and its dependencies, or from the Colonies of Grenada, St. Vincent, and St. Lucia, provided, however, that small quantities of cotton seed for experimental purposes may be imported into the Presidency of Dominica, on the written permission of the Superintendent of Agriculture on such terms and conditions as he may prescribe.

A Proclamation dated December 21, 1920, prohibits the importation of sugar cane from any other country into this Presidency, for the time being.

LIME EXPERIMENTS.

A Proclamation dated February 21, 1921, prohibits the importation of Johnson Grass from any other country into this Presidency, (*Holcus halepensis*).

A Proclamation dated January 28, 1923, prohibits the importation of Banana plants, (suckers), from all countries except other Leeward Islands, Grenada, St. Vincent and Barbados.

A Proclamation dated February 20, 1923, prohibits the importation of citrus plants from all countries except the Windward & Leeward Islands, Trinidad & Tobago, and Barbados. It is, however, allowed that the Curator or agricultural officer shall have the power to import for scientific purposes anything thus prohibited, on his making a report of such importation for the information of the Governor.

A Proclamation dated December 24, 1923, prohibits the importation of coconuts and coconut plants from any other country into this Presidency, until further orders.

With regard to the export of plants, it is only necessary to state that such cannot be admitted into the United States unless accompanied by a certificate showing that they have been inspected by a duly authorized official, and found free from injurious plant diseases or insect pests.

Report on the Lime Experiment Station, Dominica.

This Station was started in April, 1913, and the first planting of limes was in July of the same year. A statement showing the expenditure and receipts during the eleven year period is given below:—

							Expenditure.	Receipts.
							£ s. d.	£ s. d.
1913-14	...	...	...	...	...	...	59 0 0	17 9 7
1914-15	...	...	...	...	...	...	70 0 0	61 1 5
1915-16	...	...	...	...	...	...	120 0 0	86 9 10
1916-17	...	...	...	...	...	...	175 0 0	121 2 11
1917-18	...	...	...	...	...	...	175 0 0	180 12 2
1918-19	...	...	...	...	...	...	200 0 0	233 12 8
1919-20	...	...	...	...	...	...	250 0 5	625 6 7
1920-21	...	...	...	...	...	...	320 0 0	741 8 2
1921-22	...	...	...	...	...	...	400 0 0	456 8 3
1922-23	...	...	...	...	...	...	350 0 0	423 1 2
1923-24	...	...	...	...	...	...	350 0 0	515 3 5
Cost of manures to date	...	...	...	...	...	...	270 0 0	
Cost of drainage (from Special Service Grant)	...	...	...	...	...	...	48 3 0	
Head Labourer's house	...	...	...	...	...	...	60 0 0	
Shed for housing mill, etc.,	...	...	...	...	...	...	100 0 0	
							12,938 3 0	£3,461 16 2

LIME EXPERIMENTS.

Supervision, always a considerable charge, has cost nothing in this instance the work having been done by the agricultural officers. A fair amount of assistance has also been given by the two or three agricultural pupils who have been under training during recent years. These were from time to time engaged in sowing green dressings, applying manures, pruning trees, and other work of a light character.

It should be clearly understood that the figures of expenditure given above not only maintain the present bearing area of limes, which includes the gathering and transport of the crop to the Bath Estate, but also covers the cost of upkeep of about 5 acres of young lime cultivation, 8 acres of young coconuts, and a further area of 2 acres consisting of plots of grapefruits, camphor, etc.

During the eleven years of its existence the Experiment Station, so far as the disposal of the crop is concerned, has been in the position of a small grower, that is, the ripe and green limes have had to be sold in the open market at the current ruling prices. For purposes of record, a table has been prepared which shows the local market rates per barrel of fruit since 1914-15:—

RIPE LIMES.

Year.	Barrels of fruit.	Amount received.			Rate per barrel.		
		£	s.	d.	£	s.	d.
1914-15	222	61	1	5	5	6	
1915-16	315	86	9	10	5	6	
1916-17	541	121	1	1	4	5½	
1917-18	649	180	12	2	5	6¾	
1918-19	1,070	221	2	8	4	1½	
1919-20	1,589	498	1	6	6	5½	
1920-21	2,571	688	17	4	5	4¼	
1921-22	2,485	456	8	3	3	8	
1922-23	2,916	423	1	2	2	10¾	
1923-24	2,502	453	15	5	3	7½	

GREEN LIMES.

Year.	Barrels of fruit.	Amount received.			Rate per barrel.		
		£	s.	d.	£	s.	d.
1918-19	10	12	10	0	1	5	0
1919-20	191	127	5	1	13	3¾	
1920-21	55½	52	10	10	18	11	
1921-22	...	...	...	...	...	...	...
1922-23	...	...	...	...	...	...	...
1923-24	66	61	8	0	18	7	

The crop for the year was 2,502 barrels of ripe limes, and 66 barrels of green limes, all of which were sold in the local market, and realized £515 3. 5. Six barrels of green limes were shipped to the Manchester Fruit Show. The total crop for the year was 2,574 barrels of fruit.

MANURIAL EXPERIMENTS WITH LIMES.

MANURIAL EXPERIMENTS WITH LIMES

The main manurial experiments now carried on consist of five plots three times repeated, two series with young limes, and one series with old limes. They are as follows:—

- A. Complete manure of nitrogen, phosphates and potash.
- B. Control. No manure.
- C. Mulch of grass, 5 tons per acre.
- D. Nitrogen and phosphates
- E. Nitrogen and potash.

In each case the nitrogen was originally applied in the form of Swift's manure 8, per cent ammonia at the rate of 4 cwt. per acre, but for a period of three years this manure could not be obtained, and the equivalent in the form of Cotton seed meal was applied instead. During the past two years dried blood, 14 per cent ammonia, has been used.

The mulch applied is mainly in the form of lemon grass, supplemented by leaves and young shoots of *Gliricidia maculata*. Both forms of mulch are especially grown on what would otherwise be waste grounds in the vicinity of the plots. This system of utilizing odd corners, steep hillsides, and the banks of streams for growing material for application to cultivated areas is strongly recommended in Dominica.

The phosphatic requirements of the plots are furnished in the form of basic slag, applied at the rate of 4 cwt. per acre, and the potash, by sulphate of potash at the rate of 1½ cwt. per acre. During 1920-21 neither of these manures could be obtained, and the falling away of the crop during 1921-22 is in some measure due to the lack of these fertilizers. During recent years sulphate of potash was again available, and as basic slag could not be got, 16 per cent acid phosphate was used in its place.

The yields of these plots in barrels of fruit, during the period 1917-18 and 1923-24 are given below:—

SEVEN YEARS' RESULTS OF MANURIAL EXPERIMENTS WITH LIMES.

ORIGINAL SERIES.

Trees planted July, 1913.

Year.	Size of plots.	A. Complete manure.		B. Control.		C. Mulch.		D. Nitrogen and phosphates		E. Nitrogen and potash.	
		per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
1917-18	¼-acre	15½	63	14	56	23½	95	23½	95	73½ ^{73¼}	31
1918-19	"	60	240	45½	183	71½	287	58½	234	34½	139
1919-20	"	85	340	89½	358	99½	398	88½	354	60½	242
*1920-21	"	118½	475	169½	437	130½	522	117½	470	112	448
1921-22	"	95	380	85½	343	99	396	85½	343	86	344
1922-23	"	88	352	68½	274	95½	382	81½	326	90½	362
†1923-24	"	56½	225	47½	189	69½	279	56½	226	63	252

*No Phosphates or Potash applied that year.
First complete year under "withertip,, conditions.

MANURIAL EXPERIMENTS WITH LIMES.

DUPLICATE SERIES.

Trees planted July 1913.

Year.	Size of plots.	A.		B.		C.		D.		E.	
		Complete manure.		Control.		Mulch.		Nitrogen and phosphates.		Nitrogen and potash.	
		per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
1917-18	$\frac{1}{4}$ -acre	$6\frac{3}{4}$	27	$10\frac{1}{4}$	41	18	72	$6\frac{3}{4}$	27	$10\frac{3}{4}$	43
1918-19	"	$34\frac{3}{4}$	139	$22\frac{1}{2}$	90	$42\frac{1}{4}$	169	30	120	$38\frac{1}{2}$	154
1919-20	"	$57\frac{3}{4}$	231	38	152	$69\frac{3}{4}$	279	$60\frac{1}{2}$	242	$72\frac{1}{2}$	290
*1920-21	"	117	468	$81\frac{1}{2}$	326	$115\frac{1}{2}$	462	$105\frac{3}{4}$	423	$115\frac{3}{4}$	463
1921-22	"	79	316	$52\frac{1}{4}$	209	$85\frac{1}{2}$	342	81	324	94	376
1922-23	"	77	308	45	180	80	320	82	328	97	388
†1923-24	"	$55\frac{1}{4}$	221	$35\frac{3}{4}$	143	$60\frac{1}{2}$	242	54	216	97	282

TRIPLICATE SERIES.

Old Trees planted 1893.

Year.	Size of plots.	A.		B.		C.		D.		E.	
		Complete manure.		Control.		Mulch.		Nitrogen and phosphates.		Nitrogen and potash.	
		per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.	per plot.	per acre.
1917-18	$\frac{1}{4}$ -acre	45	180	$29\frac{3}{4}$	119	$25\frac{1}{2}$	102	$27\frac{1}{2}$	110	$22\frac{3}{4}$	91
1918-19	"	70	280	$32\frac{1}{2}$	130	23	92	$52\frac{1}{2}$	210	$34\frac{1}{2}$	138
1919-20	"	$89\frac{3}{4}$	359	$48\frac{1}{2}$	194	32	128	$67\frac{1}{4}$	269	50	200
*1920-21	"	$85\frac{1}{4}$	341	$52\frac{1}{2}$	210	$43\frac{3}{4}$	175	97	388	$64\frac{3}{4}$	259
1921-22	"	74	296	$42\frac{1}{2}$	170	40	160	79	316	$73\frac{3}{4}$	295
1922-23	"	69	276	34	136	37	148	86	344	70	280
†1923-24	"	$54\frac{1}{2}$	218	$26\frac{1}{2}$	106	$45\frac{1}{4}$	181	$61\frac{1}{4}$	245	$56\frac{1}{4}$	225

While a period of seven years is hardly sufficient to allow of definite conclusions being reached in the case of manurial experiments with orchard cultivation, this view need not prevent consideration of the yields of the plots collectively. The ten plots of young limes, which cover an area of $2\frac{1}{2}$ acres, were planted in July 1913, and are therefore, at the end of March 1924, ten years and nine months old from the time of being placed out in the field. The crop returns during this period are as follows:—

1917-18	5th year	...	$137\frac{1}{2}$	barrels or	55	barrels per acre.
1918-19	6th "	...	$438\frac{3}{4}$	" "	175	" " "
1919-20	7th "	...	$721\frac{1}{4}$	" "	288	" " "
1920-21	8th "	...	1,124	" "	450	" " "
1921-22	9th "	...	$844\frac{1}{2}$	" "	338	" " "
1922-23	10th "	...	805	" "	322	" " "
1923-24	11th "	...	$568\frac{3}{4}$	" "	227	" " "

*No phosphates or potash applied that year.
 †1st complete year under "Withertip" conditions.

RESULTS OF MANURIAL EXPERIMENTS WITH LIMES.

These results are especially remarkable in view of the fact that only $\frac{1}{2}$ acre of the $2\frac{1}{2}$ acres receives a complete concentrated manure, and whilst one acre in this area receives an incomplete manure and $\frac{1}{2}$ acre an application of mulch—a complete, but slow acting manure—the remaining $\frac{1}{2}$ acre receives no manurial treatment at all.

A better idea of the effects of the various manures and cultural measures carried on, may be gained from the table below, in which the plots, each receiving identical treatment in the three series of experiments, are grouped together. This table shows at a glance the actual yield per three plots of a kind grouped together, the calculated yield per acre, and the increase, or decrease per acre, per annum compared with the previous year.

3 COMPLETE MANURE PLOTS. ($\frac{1}{4}$ ACRE EACH.)

Year.	Area.	Yield in Barrels Per $\frac{3}{4}$ Acre.	Calculated yield in Barrels per Acre.	Increase or decrease per Acre compared with previous year.
1917-18	$\frac{3}{4}$ Acre	67 $\frac{1}{2}$	90	+
1918-19	„	164 $\frac{3}{4}$	210 $\frac{2}{3}$	+ 129 $\frac{2}{3}$
1919-20	„	232 $\frac{1}{2}$	310	+ 90 $\frac{1}{3}$
*1920-21	„	321	428	+ 118
1921-22	„	248	330 $\frac{2}{3}$	- 97 $\frac{1}{2}$
1922-23	„	234	312	- 18 $\frac{2}{3}$
†1923-24	„	163 $\frac{1}{2}$	222	- 90
		1,434 $\frac{1}{4}$	= Total yield for 7 yrs	

3 CONTROL PLOTS. ($\frac{1}{4}$ ACRE EACH.)

Year.	Area.	Yield in Barrels per $\frac{3}{4}$ Acre.	Calculated yield in Barrels per Acre.	Increase or decrease per Acre compared with previous year.
1917-18	$\frac{1}{4}$ Acre.	54	72	
1918-19	„	100 $\frac{3}{4}$	134 $\frac{1}{3}$	+ 62 $\frac{1}{3}$
1919-20	„	176	234 $\frac{2}{3}$	+ 100 $\frac{1}{3}$
1920-21	„	243 $\frac{1}{4}$	324 $\frac{1}{3}$	+ 89 $\frac{2}{3}$
1921-22	„	180 $\frac{1}{4}$	240 $\frac{1}{3}$	- 84
1922-23	„	147	196	- 44 $\frac{1}{3}$
†1923-24	„	109 $\frac{1}{2}$	146	- 50
		1,010 $\frac{3}{4}$	= Total yield for 7 yrs.	

* No phosphates or potash applied that year

† First complete year under "Withertip" conditions

RESULTS OF MANURIAL EXPERIMENTS WITH LIMES.

3 MULCH PLOTS ($\frac{1}{4}$ ACRE EACH.)

Year.	Acre.	Yield in Barrels Per $\frac{3}{4}$ Acre.	Calculated yield in Barrels per Acre.	Increase or decrease per Acre compared with previous year.
1917-18	$\frac{1}{4}$ Acre.	67 $\frac{1}{4}$	89 $\frac{2}{3}$	
1918-19	"	138	184	+ 94 $\frac{1}{3}$
1919-20	"	201 $\frac{1}{4}$	268 $\frac{1}{3}$	+ 84 $\frac{1}{3}$
1920-21	"	289 $\frac{3}{4}$	386	+ 117 $\frac{2}{3}$
1921-22	"	224 $\frac{1}{2}$	299 $\frac{1}{3}$	- 86 $\frac{2}{3}$
1922-23	"	212	282 $\frac{2}{3}$	- 16 $\frac{2}{3}$
†1923-24	"	175 $\frac{3}{4}$	234	- 48 $\frac{1}{3}$
		1,208 $\frac{1}{2}$	= Total yield for 7 yrs	

3 NITROGEN AND PHOSPHATES PLOTS ($\frac{1}{4}$ ACRE EACH.)

Year.	Acre.	Yield in Barrels Per $\frac{3}{4}$ Acre.	Calculated yield in Barrels per Acre.	Increase or decrease per Acre compared with previous year.
1917-18	$\frac{3}{4}$ Acre	64 $\frac{3}{4}$	86 $\frac{1}{3}$	
1918-19	"	141	188	+ 101 $\frac{2}{3}$
1919-20	"	216 $\frac{1}{4}$	288 $\frac{1}{3}$	+ 100 $\frac{1}{3}$
1920-21	"	320 $\frac{1}{4}$	427	+ 138 $\frac{2}{3}$
*1921-22	"	240 $\frac{1}{2}$	320 $\frac{2}{3}$	- 106 $\frac{2}{3}$
1922-23	"	250	333 $\frac{1}{3}$	+ 12 $\frac{2}{3}$
†1923-24	"	171 $\frac{3}{4}$	229	- 104 $\frac{1}{3}$
		1,404 $\frac{1}{2}$	Total yield for 7 years.	

3 NITROGEN & POTASH PLOTS ($\frac{1}{4}$ ACRES EACH.)

Year.	Acre.	Yield in Barrels Per $\frac{3}{4}$ Acre.	Calculated yield in Barrels per Acre.	Increase or decrease per Acre compared with previous year.
1917-18	$\frac{3}{4}$ Acre.	41 $\frac{1}{4}$	55	
1918-19	"	107 $\frac{3}{4}$	134 $\frac{2}{3}$	+ 88 $\frac{2}{3}$
1919-20	"	183	244	+ 100 $\frac{1}{3}$
*1920-21	"	292 $\frac{1}{2}$	390	+ 146
1921-22	"	253 $\frac{3}{4}$	338 $\frac{1}{3}$	- 51 $\frac{2}{3}$
1922-23	"	257	342 $\frac{2}{3}$	+ 3 $\frac{2}{3}$
†1923-24	"	190	253 $\frac{1}{4}$	- 89 $\frac{1}{2}$
		1,325 $\frac{1}{4}$	Total yield for 7 years.	

* No phosphates or potash applied that year.

† First complete year under "Withertip" conditions.

RESULTS OF MANURIAL EXPERIMENTS WITH LIMES.

The considerable falling off in yields during the period under review is probably entirely due to the presence of the withertip disease of limes which was first noticed in the Experiment Station in July, 1922.

The above records are, however, valuable, as showing what could be done under average conditions on estates during the first eleven years of working, and prior to the advent of withertip, if the cultural and manurial requirements of the trees are attended to. Had the whole area of 2½ acres received a complete concentrated manure, the returns would have been bigger than those shown in the table.

Judging by Dominica standards, all the plots, including those receiving no manure have done well. In the latter instance the influence of good cultural measures, apart from the application of manures, must be evident to all who study the table of crop returns.

The mulched plots, although not giving the highest return, are of special interest to lime growers. As is well known this material is without the forcing effect of concentrated fertilizers, but it is cumulative in its effect. It is practically certain that the standard of health of the lime tree is higher in the mulched than in any of the plots receiving concentrated manures only. This material, which is so abundant in the island, should be the chief manure used by cultivators. To the present however, only a few planters have realized its great value in agriculture.

Owing to the fluctuating prices, it is not possible to state with any accuracy the cost of applying a complete manure per acre, but if we assume the amount to be in the vicinity of £6, we find by taking the average value of a barrel of limes at 5/— that an increase in the crop per acre of about 21 barrels is sufficient to cover the cost of the application. It will be seen from the results of the experiments shown in the table above that the application of a complete concentrated manure has not only paid, but yielded a considerable profit in addition.

OTHER MANURIAL EXPERIMENT PLOTS.

Both seedling and spineless limes budded on sour orange stocks, and ordinary seedlings, have been under experiment since 1914, and occupy one acre of land.

The acre is divided up into ¼ acre plots as follows: two plots of common limes budded on sour orange stocks: one plot of spineless limes on the same kind of stocks: and one plot of ordinary seedling limes for comparison.

During 1917-18 and 1918-19 the trees in each plot have received a small dressing of organic nitrogen at the rate of 4 cwt per acre. During the first three years of their existence, No. 1 budded plot, (see table below), was grown with Tephrosia as a green dressing, whilst No. 2 budded plot was grown in the usual way with weeds and grass, which was occasionally weeded. The spineless lime had green dressings of horse beans, and the seedling limes were clean weeded. Early in 1919-20 each plot received a complete manure of nitrogen, phosphates and potash. It is intended to maintain this series as complete manure plots. The crops yield off the four plots since fruiting commenced are as follow:—

RESULTS OF MANURIAL EXPERIMENTS WITH LIMES.

SEVEN YEARS' RESULTS OF EXPERIMENTS CONDUCTED WITH SPINELESS, AND
COMMON LIMES, BUDDED ON SOUR ORANGE STOCKS, AND WITH
COMMON SEEDLING LIMES.

PLANTED JULY 1914.

SPINELESS LIMES BUDDED ON SOUR ORANGE STOCKS.

Year.	Size of plot.	Actual yield in barrels per plot.	Calculated yield in barrels per acre.
1917-18	$\frac{1}{4}$ acre	$6\frac{1}{2}$	26
1918-19	"	$18\frac{1}{4}$	73
1919-20	"	34	136
*1920-21	"	46	184
1921-22	"	$45\frac{1}{2}$	182
1922-23	"	62	248
†1923-24	"	26	104

COMMON LIMES BUDDED ON SOUR ORANGE STOCKS. (PLOT 1.)

Year.	Size of plot.	Actual yield in barrels per plot.	Calculated yield in barrels per acre.
1917-18	$\frac{1}{4}$ acre	8	32
1918-19	"	$34\frac{3}{4}$	139
1919-20	"	$39\frac{3}{4}$	159
*1920-21	"	$98\frac{1}{2}$	394
1921-22	"	$91\frac{3}{4}$	367
1922-23	"	132	528
†1923-24	"	59	236

COMMON LIMES BUDDED ON SOUR ORANGE STOCKS. (PLOT 2.)

Year.	Size of Plot.	Actual yield in barrels per plot	Calculated yield in barrels per acre.
1917-18	$\frac{1}{4}$ acre	6	24
1918-19	"	$13\frac{3}{4}$	55
1919-20	"	$31\frac{1}{4}$	125
*1920-31	"	86	344
1921-22	"	$73\frac{3}{4}$	295
1922-23	"	121	484
†1923-24	"	$65\frac{1}{4}$	261

*No Phosphates or Potash applied that year.

†First complete year under "Withertip" conditions.

EXPERIMENTS WITH SEEDLING LIMES.

COMMON SEEDLING LIMES.

Year.	Size of plot.	Actual yield in barrels per plot.	Calculated yield in barrels per acre.
1917-18	$\frac{1}{4}$ acre	Nil	Nil
1918-19	"	16 $\frac{3}{4}$	67
1919-20	"	22 $\frac{3}{4}$	91
*1920-21	"	61	244
1921-22	"	58	232
1922-23	"	64 $\frac{1}{2}$	258
†1923-25	"	55 $\frac{3}{4}$	223

The returns from the four plots (or 1 acre), since bearing commenced, are as follows:—

1917-18	4th. year	...	201 $\frac{1}{2}$	barrels of limes
1918-19	5th "	...	83 $\frac{1}{2}$	" " "
1919-20	6th "	...	127 $\frac{3}{4}$	" " "
1920-21	7th "	...	291 $\frac{1}{2}$	" " "
1921-22	8th "	...	269	" " "
1922-23	9th "	...	379 $\frac{1}{2}$	" " "
1923-24	10th "	...	206	" " "

In this particular experiment the budded plants have done better than seedling limes, but whether the lead will be maintained is a matter which future work will be able to determine.

RECENTLY STARTED MANURIAL EXPERIMENT PLOTS.

Three new series, each consisting of three plots, were started early in 1921. The treatment given in the first series is repeated three times. The plots are numbered 16 to 24.

The treatment given is as follows:—

Series I.	Plot 16.	Ready mixed complete fertilizer, (8 per cent. nitrogen, 10 per cent. phosphates and 4 per cent. potash), at the rate of 500 lb. per acre (with mulch -2 $\frac{1}{2}$ tons per acre).
	Plot 17.	Control. (No fertilizer or mulch).
	Plot 18.	Ready mixed complete fertilizer, (8 per cent. nitrogen, 10 per cent. phosphates, 4 per cent potash) at the rate of 1,000 lb. per acre (with mulch -2 $\frac{1}{2}$ tons per acre).

It is proposed to publish the crop returns of these plots in the next Annual Report, when the figures for four years will be available.

The addition of nine plots brings the number of experiment plots now being conducted at the Station, up to thirty. The twenty-one plots running before the new experiments were started involved no less than 1,809 separate measurements and records, an average of eighty six pickings per plot. With the addition of three new series this work connected with measuring and recording will be greatly increased involving as it will close on 2,600 measurements each year. What this means can be understood only by those who carry on the work. The need of so much recording is the chief reason why so few experiments are made on lime estates; owners, managers, and overseers

*No Phosphates or Potash applied that year.

†First complete year under "Withertip" conditions.

GENERAL CONCLUSIONS.

alike finding it very difficult to keep accurate returns of the crop, which under good cultivation is coming in over eight months of the year, and practically all the year round in the case of well manured young limes.

To carry on a series of plot experiments with limes is difficult and exacting. Similar plot work in connexion with sugar, cotton, and even with cacao, appears to be very easy when compared with the requirements, as regards crop records, of the lime tree under experimental cultivation.

GENERAL REMARKS.

The best advice that can at present be given to those planters who are fortunate enough to possess lime cultivation with a favourable environment is to carry out good cultural measures, to drain soundly, and to apply mulches and potash. The planter will reply that it is a very expensive matter to cut grass and bush and transport it to the cultivation, and particularly so when the material has to be carried uphill, or applied to trees growing on steep slopes. And there is no doubt that the planter is right in his contention; but there are few places in Dominica, a country in which the bulk of the cultivation is made up of small areas, where the material could not be grown alongside the lime fields and the cost of transport very largely reduced.

At the Experiment Station clearings for growing mulches have been made on the slopes above the lime cultivation and in certain instances alongside the cultivation on lands too exposed or too poor for limes. Material so grown is not over costly to cut and to apply; while the benefits which follow its application are great. The practice carried on at the Experiment Station could well be followed on many estates and small holdings.

The following plants are grown in the Experiment Station for mulching purposes:—Elephant grass, Guinea grass, Uba cane, Lemon grass, *Saccharum ciliare* and to some extent, *Gliricidia maculata*. Considerable distributions of cuttings of the two first named have been made to a few estates for growth as mulching material. It is to be hoped that in the near future the production of this valuable manure on lands adjoining cultivated areas will be largely practised in this island.

In the progress Report for 1922-23, the results given by the limes budded on sour orange stocks, compared with seedling limes, were discussed, and it was pointed out that the former not only yielded more fruit, but that the limes also gave more juice with a higher citric acid content than did the fruit from seedling trees.

Tests made during 1923-24 again showed the fruit of the budded limes to be superior in citric acid, the advantage being $1\frac{1}{2}$ oz. per gallon over the acid content of the juice from seedling limes grown under exactly similar conditions as regards soil, climate, cultivation and manures.

Reference was also made in the report to the high cost of budded plants over seedling plants. It would appear, however, that there are several advantages to be gained from the use of the former such as increased bearing powers more juice with a greater acid content, and less uprooting of trees during the prevalence of high winds, owing to the greater holding power afforded by the tap and lateral roots of the sour orange stock.

In the search for varieties of sour citrus immune to withertip disease, which is now being made, such, if found, will have to be budded on either sour orange, rough lemon or other suitable citrus stocks. It will be interesting to note whether other seedling varieties of sour citrus will show a higher citric acid content of the juice when budded on sour orange stocks. Such information should be forthcoming in Dominica in the course of a year or two.

DETAILS OF ADMINISTRATION.

CACAO EXPERIMENTS.

The new series of manurial experiments with cacao, consisting of ten plots (details of which were given in the Annual Report for 1922-23) are being carried on, but it is not intended to publish the crop returns until the figures for three years are available.

These plots are a continuation of a series of manurial experiments commenced in 1902, which consisted of the usual control plots and others, some of which received incomplete and some complete manures. The crop records were published in the Annual Reports. At the end of twenty years, new manurial treatment was started in which each plot now receives a complete fertilizer.

This new series of complete manure plots should prove of value to those interested in cacao cultivation.

DETAILS OF ADMINISTRATION

EXPENDITURE.

The votes for the Agricultural Department for the year were as follows :—

	£.	s.	d.
Salaries, Curator, Assistant Curator)			
Foreman, Clerk and Watchman)	913	0	0
Contingencies	10	0	0
Travelling Expenses	50	0	0
Maintenance	280	0	0
Cultivation of saleable products	275	0	0
Fumigation of imported plants	5	0	0
Maintenance, Public Gardens	15	0	0
Purchase of special manure	100	0	0
Printing reports	40	0	0
Experimental Station	400	0	0
Purchase of vegetable seeds	25	0	0
Trial shipments of fruit	20	0	0
Chemicals and Apparatus	25	0	0
Telephone rental	15	0	0
Uniform for Watchman	3	0	0
Agricultural Instruction	160	0	0
	£2,336	0	0

The actual expenditure during the year under the above heads was £2,019. 11. 6.

Additional Expenditure for Special Services.

Withertip Disease :—Purchase of apparatus and dusting materials	£113	19	2
Publication of Guide Book	59	15	10

STAFF CHANGES, CORRESPONDENCE, ETC.

RECEIPTS.

The receipts under the various heads were as follows :—

	£	s.	D0
Limes	515	3	5
Cacao	48	6	6
Fruit	49	9	7
Plants	35	16	
Vegetable seeds	11	12	1
Nutmegs	1	9	18
Miscellaneous	2	12	2
Total	£664	10	10

STAFF CHANGES.

Mr. A. Keys, Assistant Curator, resigned in July, and left the island on August 2 for Washington, U. S. A. in order to take up an appointment in the Bureau of Plant Industry, United States Department of Agriculture. At the end of the official year (March 31) the post of Assistant Curator in this Department was still vacant.

ADDITIONS AND REPAIRS.

Minor repairs to several buildings were effected during the year.

CORRESPONDENCE AND DISTRIBUTION OF INFORMATION.

During the year 614 communications were despatched from the office of the Department and 156 minute papers dealt with. Four hundred and eighty copies of the Annual Report on the Agricultural Department for 1922-23 were distributed free of charge to leading planters, officials, and others in the island and abroad.

Of literature dealing with withertip disease of limes, one hundred and seventy copies of a report by Mr. F. Stell, Mycologist on the staff of the Agricultural Department, Trinidad, were printed and distributed locally to planters and other interested parties.

The "Official Guide to the Botanic Gardens, Dominica," first published in 1915, was brought up to date, and reissued. It is now on sale at the Gardens and the Public Library at the rate of 1/- per copy.

As usual a considerable number of planters and others desiring information on agricultural matters called at the Gardens during the year.

A few new books were added to the library during the year, and the publications of a number of Agricultural Departments and other Scientific Institutions were duly received. The opportunity is again taken to thank those who kindly forward their publications.

PLANT AND SEED EXCHANGES, FOREIGN AND LOCAL.

Contributions of seeds and plants were received from the following:—

United States Department of Agriculture; Botanic Gardens, Ceylon; Silviculturist, Burma; Experiment Station, Tortola; Superintendent of Agriculture, Leeward Islands; the Agricultural Departments of Grenada and St. Vincent, and Mr. Jose Garcia Mortes (jr.) Cuba.

OFFICIAL VISITS.

Seeds and plants were sent to : Royal Botanic Gardens, Kew ; United States Department of Agriculture ; Botanic Gardens, Mauritius ; the Museum, Philadelphia U. S. A. Department of Agriculture, Ceylon ; Ministry of Agriculture, Cairo, Egypt ; Agricultural Adviser, Porto Rico ; Agricultural Department, Trinidad ; Experiment Station, Tortola ; S. W. Howes, Esq., Montserrat, and E. W. Outerbridge, Esq., Bermuda.

OFFICIAL AND OTHER VISITS TO THE GARDENS.

His Excellency the Governor, the Hon. Sir Eustace Fiennes, Bart. accompanied by the Hon. Lady Fiennes, O.B.E., visited the Gardens on October 20 and again in February 25.

Hon. A. E. Collens, F.I.C., F.C.S. Government Chemist and Superintendent of Agriculture for the Leeward Islands, arrived in the island on June 24 for the purpose of undertaking chemical investigations, and returned to Antigua on July 26. Mr. Collens again returned to Dominica on November 19 and left for Antigua on December 9.

Mr. F. Stell, Mycologist on the staff of the Agricultural Department Trinidad, arrived in the island on October 27 for the purpose of investigating wither-tip disease of limes. He left for Trinidad on December 5. Mr. Stell paid another visit to Dominica on February 15 and returned to Trinidad on March 10.

Mr. Wiltshire, B.A., B.Sc., of the Imperial Bureau of Mycology, London arrived in Dominica on February 15. This visit of the representative of the Bureau of Mycology at the Jamaica Agricultural Conference, was specially allowed by the Colonial Office on the request of the Administrator of Dominica, as both the local Agricultural Department and many planters considered it to be highly desirable that a member of the Bureau of Mycology, London, should be aware of the conditions under which lime trees are grown before any further recommendations were made by the Bureau in connexion with the control of wither-tip disease. Mr. Wiltshire sailed for England on February 26.

Other visitors during the year were Dr. Gerritt S. Miller of the United States National Museum, and Mr. O. W. Barret, Agricultural Adviser to the Government of Porto Rico.

METEOROLOGICAL RETURNS.

Temperatures and other meteorological observations, a summary of which is given in a table at another page, were recorded during the year.

RAINFALL.

The rainfall at the Botanic Gardens for 1923 amounted to 54.40 inches or 2.84 inches less than the previous year, and 21.49 inches less than the average annual precipitation for the last thirty-one years which is 75.89.

The following table shows the mean monthly and annual rainfall at the Botanic Gardens from 1893 to 1923, a period of thirty-one years.

Following the above will be seen the monthly rainfall at the twenty-six recording stations located in different parts of the island. The thanks of the Department are due to those planters who furnish the information from year to year.

RAINFALL AT THE BOTANIC STATION, DOMINICA, 1895-1923.

Month.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922.	1923.	Mean monthly rainfall.
Jan. ...	4.08	5.52	2.60	3.00	6.78	2.25	4.52	2.01	3.10	7.92	3.86	3.74	4.48	1.56	2.30	5.20	11.46	8.21	7.48	3.22	1.76	10.79	5.00	6.02	2.42	7.54	6.82	6.50	3.82	5.09
Feb. ...	1.09	1.23	3.21	2.11	3.00	1.15	0.88	0.43	5.01	5.58	2.56	2.04	3.82	1.16	5.02	11.42	4.00	1.32	2.32	5.56	1.04	1.90	4.10	8.73	1.52	4.76	1.02	4.30	2.30	3.39
March...	5.35	2.73	3.36	1.53	1.32	3.56	3.27	2.69	2.44	2.16	4.38	0.90	1.96	3.68	2.08	1.16	3.11	4.60	7.29	2.23	0.84	4.52	6.74	3.32	0.69	3.80	4.46	2.80	3.46	3.15
April ...	2.92	1.27	1.39	0.75	0.60	1.29	0.25	2.80	0.57	1.61	1.90	3.18	2.66	3.08	8.12	2.86	5.00	3.38	1.57	6.45	15.75	1.22	0.47	1.86	2.36	.22	3.06	2.26	3.77	2.89
May ...	10.08	6.12	12.75	1.19	1.76	7.62	2.05	6.86	2.11	1.58	4.32	3.78	1.61	2.24	1.92	7.30	11.16	1.56	3.46	2.58	3.65	2.05	2.94	5.90	4.60	2.38	1.54	2.61	0.13	4.09
June ...	3.19	8.23	6.50	11.78	7.23	5.59	12.18	12.89	9.02	6.00	5.54	9.46	5.54	6.16	9.00	14.26	6.54	5.44	3.49	7.27	9.17	4.82	15.34	6.04	3.88	3.48	1.96	7.14	1.18	7.59
July ...	7.13	14.88	8.80	11.75	10.08	10.50	22.96	9.74	8.91	10.38	6.10	10.10	8.00	9.22	9.86	12.60	8.08	5.83	7.57	11.83	14.81	8.23	13.70	11.28	12.64	12.08	11.18	6.08	8.20	10.57
Aug. ...	9.67	7.07	8.87	16.35	6.32	7.34	13.53	7.41	18.41	7.69	14.18	7.30	7.40	9.41	13.12	10.22	11.43	4.88	10.93	3.48	14.74	16.58	8.53	8.46	9.64	8.76	9.30	9.26	11.44	9.99
Sept. ..	17.72	6.47	4.51	7.89	7.04	5.28	5.86	8.62	9.69	11.32	8.92	10.88	11.60	7.52	6.44	8.90	15.34	5.32	8.39	7.71	11.36	6.20	15.02	4.14	7.06	8.60	6.28	10.68	4.28	8.59
Oct. ...	11.02	3.93	8.42	7.97	1.81	6.60	4.84	5.75	12.73	10.21	9.10	8.12	7.80	5.12	13.10	3.82	7.06	7.26	10.40	5.13	8.41	10.06	2.46	6.67	7.50	12.60	9.41	2.68	9.84	7.85
Nov. ...	11.21	16.81	7.81	6.55	5.02	3.49	6.43	11.20	4.17	3.13	5.48	9.58	5.98	1.96	4.36	5.40	6.91	11.20	4.28	9.44	10.05	14.28	1.92	3.36	9.02	4.62	2.44	3.00	1.06	6.45
Dec. ...	5.66	6.60	10.55	5.86	2.19	3.68	4.32	7.16	14.23	4.81	5.72	2.94	8.42	7.80	5.82	7.50	7.14	6.66	2.72	9.70	8.40	3.77	4.58	5.86	6.70	5.62	4.22	6.90	1.92	6.22
Total	89.12	80.86	78.77	79.73	53.15	58.35	81.09	77.56	90.72	72.45	72.06	72.02	69.30	58.91	81.44	90.64	97.26	63.72	69.90	75.10	100.01	83.12	80.80	71.46	68.03	74.46	61.72	64.24	54.40	

RAINFALL RETURNS.

RAINFALL RETURNS, DOMINICA, 1923.

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Bagatelle, Soufrière	2.07	1.98	2.29	5.18	0.41	5.56	8.19	8.97	3.78	8.13	1.65	3.29	51.08
Baïalie	1.23	1.25	1.18	2.09	0.04	2.89	7.84	9.48	2.30	8.53	0.80	2.74	40.57
Bellevue	6.18	4.78	8.16	14.78	2.14	9.53	11.72	19.41	3.91	10.13	5.08	7.43	116.55
Bleuheim	6.37	3.49	3.45	4.39	1.40	6.51	10.36	7.13	3.91	8.53	2.84	5.98	64.69
Botanical Gardens	3.82	2.30	3.46	3.77	0.13	4.18	8.20	11.11	1.28	9.84	1.06	1.92	54.40
Cane-field	2.52	1.67	2.26	4.07	0.09	3.95	11.13	11.59	4.22	10.21	1.39	1.80	57.90
Castle Bruce	1.83	2.55	1.82	5.14	1.55	2.88	8.17	7.65	9.85	7.85	6.53	12.05	67.87
Everton	3.73	3.57	4.91	7.36	0.89	7.19	11.29	13.31	6.13	10.46	2.60	2.95	80.09
Goodwill	4.10	2.64	3.28	4.24	0.10	4.30	8.93	11.80	4.12	10.16	1.28	1.95	57.20
Governor	5.15	3.57	3.58	8.31	1.63	6.50	11.46	8.28	10.43	14.09	5.09	10.90	88.69
Hampstead	2.58	1.64	2.32	4.26	1.22	5.11	5.81	7.69	4.11	8.04	1.85	5.88	52.39
Hillsborough	5.40	4.69	4.53	4.10	0.30	5.57	10.70	15.71	4.03	12.93	1.45	3.40	66.92
Indian River	6.44	4.95	3.50	4.26	0.32	5.66	10.18	10.32	4.44	8.96	3.05	7.04	67.79
Kinellan	3.60	3.32	9.81	10.87	1.32	9.90	11.93	12.15	10.29	11.15	3.78	3.24	106.90
La Haut	14.99	10.46	4.70	8.23	0.00	8.07	11.25	12.15	3.98	21.67	2.97	3.18	85.12
Lakeside	1.48	3.83	13.72	27.42	7.08	18.18	35.83	31.77	21.82	20.72	12.02	29.79	249.80
Londonderry	6.05	2.90	1.25	6.80	0.52	4.07	8.02	7.18	1.07	10.65	2.30	5.40	58.57
Moore Bruce	4.68	2.22	3.10	6.05	2.92	6.51	9.10	11.02	4.15	10.22	2.49	7.31	71.87
Morne Picard	5.60	4.46	4.94	4.46	0.16	5.16	9.77	13.06	4.32	11.05	1.50	2.50	63.92
Pte. Mulâtre	4.49	1.22	3.97	4.29	0.34	3.22	9.69	10.83	3.76	9.40	3.13	5.85	64.54
Rosalie	3.31	1.10	2.88	7.61	1.21	3.98	8.68	10.47	7.54	10.51	3.25	16.32	78.03
Shawford	7.53	4.30	9.20	9.05	2.99	3.88	9.17	13.06	8.73	10.19	9.62	13.26	87.09
Soufrière	3.05	2.91	3.24	10.55	1.35	19.61	32.95	25.14	10.10	2.30	8.60	9.97	166.50
St. Arment	4.25	3.72	5.88	6.59	1.31	6.33	8.27	8.69	4.13	10.04	2.21	3.85	61.32
Stowe	4.14	3.27	5.95	5.60	0.26	9.26	13.67	14.10	6.23	8.49	1.84	8.97	82.37
				9.49	1.52	5.73	9.59	11.07	6.22	10.67	3.62	7.33	78.70

Mean Rainfall 26 Stations ... 81.57 inches.
 " " 13 Leeward Stations ... 64.09 " "
 " " 4 Windward ... 77.92 " "
 " " 4 Inland ... 159.94 " "
 " " 5 Laeayo ... 67.24

METEOROLOGICAL SUMMARY.

SUMMARY OF METEOROLOGICAL REGISTER KEPT AT POTANIC GARDENS, DOMINICA.

1923. Months.	Thermometer.			Relative Humidity.		Thermometer.		Barometer Corrected. <i>Reduced to 32° Fh. and Sea Level.</i>		Rainfall.	Wind. Average. Per hour. Per day.	Barometer Corrected.		Thermometers.		REMARKS.
	Dry.	Wet.	Humidity.	Max.	Min.	9 a.m.	3 p.m.	Highest.	Lowest.			Highest	Lowest			
Jan. ...	74.9	79.3	69.3	69.8	73.2	59.0	65.8	30.08	30.02	3.82	1.5	30.17	29.97	91	61.5	
Feb. ...	76.6	79.6	70.1	70.3	69.7	59.0	66.9	30.13	30.07	2.30	1.4	30.21	29.99	90	63	Earthquake shocks at 7.45 a.m. & 11.0 a.m. on March 31st.
March...	76.0	80.6	69.9	70.0	71.0	55.0	67.5	30.2	30.04	3.46	1.5	30.22	29.98	93	64	Earthquake shock at 8.50 p.m. on April 1st.
April	78.3	81.0	71.4	71.0	68.1	56.9	67.5	30.08	30.02	3.77	1.6	30.15	29.92	92	65	Earthquake shock at 3.5 a.m. on May 7th
May ...	84.4	86.0	73.4	73.6	54.5	50.9	69.6	30.06	30.01	0.13	1.1	30.14	29.92	97	65	Heavy squall accompanied by lightning and thunder experienced on June 7th.
June ...	81.7	81.9	74.2	74.8	66.5	57.8	90.7	30.10	30.05	4.18	1.2	30.17	30.00	94	68	Lightning and thunder on July 11th.
July ...	80.9	83.9	75.3	75.5	70.0	63.5	72.2	30.08	30.04	8.20	1.0	30.12	29.97	91.6	69.7	
August	82.1	82.8	76.0	75.4	70.2	62.0	72.3	30.07	30.04	11.44	1.5	30.16	29.97	91	70	
Sept.	82.4	83.8	76.0	75.9	70.5	65.6	72.1	30.03	29.99	4.28	1.6	30.15	29.90	93	70	Heavy squall experienced on October 16th.
October	81.6	83.5	76.2	76.5	74.3	68.0	72.2	30.00	29.95	9.84	1.9	30.12	29.81	93.2	69	
Nov. ...	81.8	83.2	74.9	75.0	68.1	63.3	70.8	30.01	29.94	1.06	1.9	30.05	29.90	93.5	67	Lightning and thunder on December 3rd.
Dec. ...	79.5	81.0	73.2	73.8	70.5	66.8	88.3	30.02	29.96	1.92	1.7	30.11	29.91	92	65	

Highest Maximum Temperature = 97° on May 30th. Lowest Minimum Temperature = 61.5° on January 5th.
 Highest Barometer (Corrected) = 30.22 on March 22nd. Lowest Barometer (Corrected) = 29.81 on October 23rd.
 Greatest Rainfall in 24 hours = 2.96 inches on August 25th.

Chemical and other Investigations Affecting Dominica Carried out by the Federal Agricultural Department during the Period

JULY 15, 1922—JULY 31, 1924.

During the period under review four official visits were paid to Dominica by the Government Chemist and Superintendent of Agriculture. During these visits analytical work and certain special investigations were conducted in the Laboratory at the Botanic Gardens.

Analyses and investigations were also made at the Federal Laboratory in Antigua, while a certain amount of consultation work was undertaken, especially during the visits to Dominica.

The following is a summary of the samples analysed:

Milks	46 samples.
Lime Juice (for total acid)	4 "
Lime Juice (for citric acid)	5 "
Lime Juice (concentrated)	2 "
Citrus Juice (for citric acid)	5 "
Citrate	2 "
Lime oil	1 "
Orange juice for oil recovery	1 "
Standard alkali	5 "
Standard acid	3 "
Lime	1 "
Bay oil	4 "
Clove oil	1 "
Rums	5 "
Water	2 "
Fertilizers	1 "
Copra	1 "
Kerosenes	2 "
Ink	1 "
	92 samples.

MILK SUPPLY

Of the 46 samples of milk analysed 45 were analysed by the Government Chemist during his visits to Dominica the remaining sample was preserved with formalin and forwarded to the Federal Laboratory for analysis. In 1922 it was arranged that formalised samples were to be sent regularly to Antigua for analysis but this arrangement was never carried out owing to the restrictions enforced during the Alastrim epidemic and legal difficulties in view of evidence etc.

SPECIAL INVESTIGATIONS.

The following summary of the 46 samples analysed affords some indication of the milk supply of Roseau during the period under review.

Date.	No. of samples.	Adulterated No.	%	Genuine No.	%	Added Water. %	Average fat content. All samples.	Average Solids not fat content. All samples.
1923.								
June-July ...	24	3	12.5	21	87.5	10 - 29	3.05	8.65
Nov.-Dec. ...	15	4	26.7	11	73.3	13 - 23	3.98	8.38
1924.								
May-June ...	6	2	33.3	4	66.7	22 - 26	3.45	7.91
Sample rec'd 21/8/22.	1	1				12.5	3.0	7.45

SPECIAL INVESTIGATIONS.

The Lime Industry.

In view of the Withertip disease special attention was paid to this industry and especially in connection with the possibility of the substitution of other types of limes in place of the West Indian type at present under cultivation.

It appears convenient here to summarize the data available as a result of the analyses conducted during the period under review of different types of citrus fruits

Fruit.	Yield of juice.	Total Solids in juice.	Total acid in juice	True Citric acid in juice.
Citrus Hystrix. ...		8.55%	6.54% (10.45 oz. per gall.)	9.54% (10.45 oz. per gallon.)
Seedling No. 2 ...	47.3		8.15% (13.03 oz. per gall.)	8.032% (12.8 oz. per gallon.)
Budded No. 1 ...	51.6		9.0% (14.5 oz. per gallon.)	8.89% (14.2 oz. per gallon.)
Sour Oranges. ...			3.15%	3.15%
Persian Limes ...	53.2		7.21% (11.5 oz. per gallon.)	7.04% (11.4 oz. per gallon.)
Wild Lemon ...			(11.1 oz. per gallon.)	11.1 oz. per gallon.)
Rangpur Hybrid ...	48.0	9.67	8.05% (12.88 oz. per gallon.)	7.70% (12.32 oz. per per gallon.)
Sicilian Lemons ... (Villa Franca type.)			7.28% (11.65 oz. per gallon.)	

During the period under review the special investigations on the nature of the colouring matter present in lime juice and which darkens on exposure to air were continued as well as a critical examination of the different phases in the preparation of commercial calcium citrate. It is hoped that in the experiments so conducted important results have been obtained and that some valuable notes on the subject will soon be published.

Lime seed oil and lime seed soap.

As a result of the work done on the preparation of lime seed oil and its subsequent publication many enquires have been received. Two companies in Barbados engaged in the manufacture of cotton seed oil, have interested themselves in this product—after interviews with the Government Chemist for the Leeward Islands—they are now canvassing for a constant supply of lime seeds.

SPECIAL INVESTIGATIONS.

This now places a product once regarded as a useless waste on an economic footing both as an oil producer and a valuable manure. The oil being valued on an equal basis as cotton seed oil while the residue from the presses is at least as valuable as cotton seed cake which at the moment of writing is worth eight pounds per ton.

A process has been worked out for the manufacture of domestic soap from lime seed oil. A description of the process recommended has been published by the Government in the *Dominica Gazette*, and subsequently reproduced, among others, in the *West India Committee Circular* and *Tropical Agriculturist*.

Many enquires have been received about this soap, samples being freely sent to the enquirers.

Purification of Lime Juice.

A good deal of time has been expended on this subject.

While it was found comparatively easy to prepare a clear juice free from colour — either by the use of isinglass, filtercel or some similar diatomaceous earth — such juices rapidly deteriorate owing to the formation of moulds. Experiments were accordingly instituted for suitable methods of preservation. It was found that the use of potassium hydrogen sulphite would preserve the juice, but subsequent correspondence with the United States Bureau of Chemistry and authorities in the United Kingdom does not hold out much promise for the use of this chemical preservative.

Preparation of pectins from citrus fruits.

Professor F. Hardy of the Imperial College of Tropical Agriculture has investigated in some detail the extraction of pectin from lime rinds with acids of varying strengths and has shown that a satisfactory extraction can be obtained when N/2 citric acid is used as extracting agent at 98°C.

The Federal Department has been investigating methods of separating the pectin from the extract in a marketable form. Concentration of the extract followed by precipitation of the pectin with alcohol has so far given the best results. This process, however, while allowing of the recovery of the citric acid and of the alcohol would be probably troublesome to work on account of revenue regulations.

ORANGE INDUSTRY.

This was investigated from the standpoint of the manufacture of orange vinegar and also for the recovery of oil from the expressed juice. At the request of the person who forwarded the samples full information was furnished on both points and a simple form of oil expresser for use with the sludge furnished. This information is freely available to persons enquiring.

BAY OIL INDUSTRY.

Dwarfed by the Lime Industry, Dominica still turns out a larger quantity of bay oil than the neighbouring island of Montserrat and in consequence careful attention was paid to this industry. As the result of the analyses of several samples the Federal Laboratory was in a position to advise manufacturers as to improvements in their methods while pointing out defects in the process adopted. As a result some very improved products have been noticed. Similarly information on the preparation of an improved type of bay rum has been imparted.

MINOR INVESTIGATIONS.

OTHER INDUSTRIES.

Special attention was also paid to the following industries :—

Pine Apple Growing. Full information was supplied to various enquirers on the subject of growing pineapples and the cheapest source for the supply of suckers furnished, also detailed information as to sizes to be shipped etc.

Ginger. The growing of this crop was especially urged as a minor industry and in order to study the various methods of preparation a wide range of commercial samples of ginger were obtained through the courtesy of the Imperial Institute. With the co-operation of Mr. J. Jones, Curator of the local Agricultural Department samples of ginger obtained locally were forwarded for experimental curing and a successful method worked out. A report on these experiments has been supplied to the Curator and samples prepared on these lines were forwarded to the British Empire Exhibition as a local exhibit. They compared favourably with any of the products received from the Imperial Institute.

Clove Oil. During one of the recent visits of the Federal Chemist to Dominica it was ascertained that the clove trees on a certain estate were flowering exuberantly and the distillation or economic marketing of the cloves was in consequence the subject of discussion. It was pointed out that either the cloves should be marketed as such or that oil should be prepared, the dominant value of each (June 1924) being Cloves 11½d—1/ per lb., oil 7/ to 7/3 per lb. (90-92% Eugenol). As a result of this enquiry a sample of the oil distilled on the estate was received for analysis and gave the following somewhat surprising results viz.

Specific Gravity @ 28°C.	...	...	...	...	1.056
Refractive Index @ 28°C.	...	...	...	...	1.531
Polariscope reading.	...	...	...	...	—3.55
Eugenol.	...	...	...	...	100%

The sample appears to consist almost entirely of eugenol and it has been suggested that a sample be forwarded to the Imperial Institute for a commercial valuation.

Tonka Beans. At the request of the Curator, a full description of the preparation of commercial Tonka beans and the subsequent utilization of this product has been forwarded. This is a valuable product and as the forests in which it is found in Venezuela are somewhat unaccessible and the crop which is very intermittent, is cured in Port-of-Spain, several hundreds of miles away from the source of collection, it is seriously worth considering whether its cultivation in Dominica could not be undertaken. Its commercial preparation is not difficult except that it has to be carried out in bond as the use of strong spirit is involved.

Logwood Extract and Ink prepared from such extracts.

As a natural corollary to the reported failing lime industry attention has been turned in every direction with the view of establishing subsidiary industries. Among these the preparation of logwood extract, a substantial but minor industry in Jamaica, Honduras, Hayti, and San Domingo was investigated. Information was furnished by the Imperial Department of Agriculture with a suggestion that the Federal Agricultural Department might be approached for further details.

Accordingly a detailed report was furnished but no further developments have resulted however as in view of the expensive nature of the machinery required it was decided that the supply of logwood available was not commensurate with the expenditure involved and the scheme was in consequence dropped.

MINOR INVESTIGATIONS.

Recently a sample of ink prepared from a logwood extract was forwarded to this department for analysis. This proved to be a type of ink prepared by a published recipe but in which the difference between a standard extract had not been considered. The ink in question was reported as belonging to the type of inks known as "acid logwood". The permanence of such inks is generally regarded as good, while their stability is poor. The stability of the sample under investigation was very poor, a heavy deposit being formed within a week leaving a pale coloured fluid, very inferior for writing purposes. Streak tests in comparison with a similar ink manufactured in this Laboratory and also Stephens blue black ink indicate that such colour as the ink in question imparts to paper has a fair permanency. The corrosive property of the ink as tested by pen nibs is small and much less than that of Stephens' blue black ink.

Coconuts. In connexion with this industry, as a result of visits to and personal investigation of the methods conducted in the drying of copra the opinion formed was that too high a temperature was being used. As a result of detailed investigation a satisfactory process was devised. The following is a brief summary of the results obtained. This information has already been communicated in detail to the persons interested.

"During the initial stages of drying, which is best conducted in a current of dry air the temperature may be kept between 73 - 80°C (164° - 176° Fahrenheit) but towards the end of the drying process it should not exceed 66°C (150° Fahrenheit) as above this temperature there is likely to be a darkening of the copra owing to the caramelisation of the thin film of saccharine matter left from the coconut water."

"It is impossible to make good copra from immature nuts. "There is a high loss in drying and the resulting copra is dark in colour, opaque instead of transparent and has a low oil content."

During a visit of the Superintendent of Agriculture to Dominica attention was called to the injurious practice common among small growers of the application of fire to the base of coconut trees and growers were strongly urged to discontinue this practice.

GENERAL At the request of the Government the following papers have been published locally:—

"THE PREPARATION OF COMMERCIAL PAPAIN by the Government Chemist

"THE MANUFACTURE OF SOAP FROM LIME SEED OIL" by the Government Chemist and Assistant Chemist.

"MINOR INDUSTRIES FOR THE LEEWARD ISLANDS." by the Government Chemist and Assistant Chemist.

British Empire Exhibition

During the period under review at the request of the local Agricultural Department much work was done in the preparation of exhibits for the British Empire Exhibition. This involved inter alia the preparation of the following exhibits:—

Lime Seed Meal.
Lime Seed Oil.
Lime Seed Oil Soap.
Commercial Ginger.
Purified Gommier Resin.
Commercial Camphor.

Information was also given as to methods of preserving fruit leaves etc. in their natural colours.



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Volume XV. No. 4.—Containing an account of the Proceedings of the West Indian Cotton Conference 1910.

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Volume VII. Nos. 1, 2, 3 and 4.—Containing Papers on General Subjects, especially cotton.

Volume VIII. Nos. 1, 2, 3, and 4.—Containing Tropical Agricultural College Committee's Report, and Papers on Miscellaneous Subjects.

PAMPHLET SERIES.

The following list gives particulars of the chief pamphlets issued by the Imperial Department of Agriculture that are still available :—

SUGAR INDUSTRY.

Seedling and other Canes at Barbados, 1900-4.

Seedling Canes and Manurial Experiments at Barbados.

in 1903-5, No. 40.	in 1904-6, No. 44.	} price 6d. each,
in 1905-7, No. 49.	in 1906-8, No. 59.	
in 1907-9, No. 62.	in 1908-10 No. 66.	

Seedling and other Canes in the Leeward Islands.

in 1900-1, No. 12.	in 1901-2, No. 20.	} price 2d. each.
in 1902-3, No. 27.		

in 1903-4, No. 33.	in 1904-5, No. 36.	} price 4d. each.
in 1905-6, No. 46.	in 1906-7, No. 60.	
in 1907-8, No. 56.		

in 1908-9, No. 63.	in 1906-10, No. 67.	price 6d. each.
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Manurial Experiments with Sugar cane in the Leeward Islands.

in 1902-3, No. 30.	in 1903-4, No. 39.	} price 4d. each,
in 1904-5, No. 42.	in 1905-6, No. 47.	
in 1906-7, No. 51.	in 1907-8, No. 57.	
in 1908-9, No. 64.	in 1909-10, No. 68.	

Sugar-cane Experiments in the Leeward Islands.

in 1910-11 price 1s. ; price 1s.

SCALE INSECTS.

Scale insects of the Lesser Antilles Part I. No. 7 price 4d.

Part II No. 22, price. 4d.

GENERAL.

(43) Cotton Seed and Cotton-cake-meal on West Indian Plantations. Price 2d.

(52) Hints for School Gardens. Price 6d.

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